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January 13, 2012

Mr. Alexander C. McDonald, Ph.D  
Technical Support  
FCT Water Treatment  
1309 North 17<sup>th</sup> Avenue  
Greeley, CO 80631

Subject: Request for Information on Wastewater Effluent Processes and Applicability to the Gerald Gentleman Station (GGS) Wastewater System and Potential Future Wet Flue Gas Desulfurization (FGD) Bleed Stream Flows

Mr. McDonald,

We discussed in late November 2011, potential options for recovering additional water from the GGS wastewater system and the potential handling and treatment of a wet FGD bleed stream due to the addition of multi-pollutant control equipment at GGS. Based on our discussion, I am very interested in equipment options that your company could recommend, design, and supply to treat and recover as much of the GGS wastewater effluent streams as possible for reuse in either existing GGS system processes or for new systems related to multi-pollutant control equipment that could be required in the future at the facility.

As we discussed, one of plant systems that I have worked on extensively over my career at the station has been the plant drains and various effluent streams. The GGS facility is considered a zero liquid discharge facility in that all plant effluent streams other than circulating water, reverse osmosis rejects, and zeolite softener rejects are routed to and collected in an evaporation pond.

My primary goal over the past several years in regard to the plant drain systems has been to seek ways to reroute these effluent streams to a central collection point and then back into the plant to be used for low quality grey water uses in various plant processes. Over the past several years, the station has been successful to a limited extent in recapturing and reusing these effluent streams.

**Gerald Gentleman Station**  
P.O. Box 68 / Sutherland, NE 69165-0068  
**Telephone:** 308-386-2441 / **Fax:** 308-386-5275  
[www.nppd.com](http://www.nppd.com)

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However, the station currently does not have enough low quality grey water uses in the plant to regularly reuse 100% of these flows.

As a result, the next step in our evaluation process has been researching equipment and processes that could be used to process the remaining effluent that we currently do not reuse in the plant in an effort to improve the chemistry and quality of these captured effluent streams to allow them to be utilized for other plant processes that require a higher water quality source.

In conjunction with this effort to maximize the recovery and reuse of the various effluent streams at GGS, our station is currently in the process of evaluating the potential impact of adding various multi-pollutant control equipment, including wet FGD to the GGS units. We understand and realize that the WFGD process would result in an effluent "bleed stream" from the system that would contain high chlorides and various other heavy metals. It is also understood that the effluent from this bleed stream would also have to be handled and dealt with most likely in a zero liquid discharge plant system design environment.

As we discussed, I have been part of a small group of station personnel who have been working with an A/E to identify methods and processes that would be required to handle a wet FGD effluent stream and how it would be integrated into the plant's entire wastewater effluent stream. However, I believe for various reasons that the A/E study and evaluation efforts on this issue have been too narrowly focused only on the FGD effluent stream. It has been difficult to get our A/E to look more broadly at our entire broad-based plant wastewater flow effluent streams, how a post-wet FGD installation may affect them, and to evaluate and describe what specific equipment and processes would be required to recycle or treat them. It has also been difficult to get the A/E to evaluate and analyze existing plant equipment that is currently abandoned in place to see if these existing plant assets (i.e. hydrobins and ash water makeup tanks, bottom ash pump house location) could be leveraged for other potential uses to deal with these issues.

As a follow-up to your visit, I would like to seek you and your company's assistance to provide information on the following subjects and to answer the following questions:

1. What equipment would FCT Water Treatment recommend to maximize the recovery and potential treatment of the effluent streams from the existing GGS wastewater recovery system or the effluent bleed stream from a wet FGD system in a post-wet FGD installation environment?

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2. Provide a written description of the proposed equipment and process flow that FCT Water Treatment would recommended by assets (i.e. abandoned in place or currently in use) that could be leveraged and used with the new system or recommended equipment.
3. What would a potential one-line diagram of this system look like?
4. What would be the power usage of the recommended equipment?
5. At a high level (+25% / - 25%), what would be the capital cost to install the recommended equipment and the O&M cost to operate it?

To help you in your initial review of these issues, I have included several pieces of information with this letter for your use. A high level summary of the information is as follows:

1. Attachment 1: GGS Wastewater Recovery Project Justification / Configuration Control

These documents were generated between 2003 and 2005 when evaluations were being completed at the station to determine how to recover various plant drains and other related effluent streams. As a result of this analysis, several of the noted action items outlined in this report have been implemented and are now in operation in the field.

2. Attachment 2: Zeolite Softener Reject Analysis

The Zeolite softener process results in a current plant effluent stream that is not recovered by the GGS wastewater system. Ideally, the plant would like to recover and reuse as much of this effluent stream as possible. The effluent flow rate from this system is estimated at 70,000 gallons every other day.

3. Attachment 3: Reverse Osmosis Reject Analysis

The reverse osmosis system utilized at the station results in a current plant effluent stream that is not recovered by the GGS wastewater system. Ideally, the plant would like to recover and reuse as much of this effluent stream as possible. The effluent flow rate from this system is estimated at 200 gpm for 16 hours a day.

4. Attachment 4: GGS Water Supply Options for Potential GGS Multi-Pollutant Control Equipment (MPCE)

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This attachment contains significant information related to the existing water supply sources present at the station and potential equipment and process design and layouts for new equipment that would be used to supply makeup water to an FGD system. Ideally, any effluent recovery system would work in conjunction with this proposed system.

5. Attachment 5: Potential Wet FGD Effluent Steam at GGS

This attachment contains information related to the quantity and quality of an estimated effluent stream from a potential wet FGD system at GGS. It should be noted that based on current industry issues, the wet FGD system at GGS would most likely be specified to operate at an equilibrium chloride level of 30,000 ppm.

Please contact me at 308-386-5312 or via e-mail at [bbnitsc@nppd.com](mailto:bbnitsc@nppd.com) if you have any questions regarding the enclosed information or the requested actions.

Bob Nitsch  
Project Engineering Leader

lmh

c: John Meacham w/o attachments  
John Rudisaile w/o attachments

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